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10/655,540	09/05/2003	Walter Hansbrough Carter JR.	02940238AA	5564

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EXAMINER	
NEGIN, RUSSELL SCOTT	
ART UNIT	**PAPER NUMBER**
1631	

DATE MAILED: 06/20/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/655,540	CARTER ET AL.	
	Examiner	Art Unit	
	Russell S. Negin	1631	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 March 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) *27-29,32 and 33* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26,30 and 31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election with traverse of Group I in the reply filed on March 23, 2006 is acknowledged. The traversal is on the ground(s) that the Groups are not mutually exclusive.

This is found persuasive between Groups I and II due to arguments in the remarks of pages 1 and 2 of the response to the restriction requirement of March 23, 2006.

This is not found persuasive between Groups I and III because Group III is devoted to a mutually exclusive method of designing experiments that achieve a target power associated with a test of additivity while Group I is a pure method of determining interactions amount constituent compounds.

Groups I and II are rejoined.

The requirement is still deemed proper and is therefore made FINAL.

Claims 27-29 and 32-33 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected Group, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on March 23, 2006.

Claims 1-26 and 30-31 are examined in this Office action.

Priority

It is noted that this application appears to claim subject matter disclosed in prior Application No. 60408232, filed September 6, 2002 and Application No. 60452933, filed March 10, 2003. A reference to the prior application must be inserted as the first sentence(s) of the specification of this application or in an application data sheet (37 CFR 1.76), if applicant intends to rely on the filing date of the prior application under 35 U.S.C. 119(e), 120, 121, or 365(c). See 37 CFR 1.78(a). For benefit claims under 35 U.S.C. 120, 121, or 365(c), the reference must include the relationship (i.e., continuation, divisional, or continuation-in-part) of all nonprovisional applications. If the application is a utility or plant application filed under 35 U.S.C. 111(a) on or after November 29, 2000, the specific reference to the prior application must be submitted during the pendency of the application and within the later of four months from the actual filing date of the application or sixteen months from the filing date of the prior application. If the application is a utility or plant application which entered the national stage from an international application filed on or after November 29, 2000, after compliance with 35 U.S.C. 371, the specific reference must be submitted during the pendency of the application and within the later of four months from the date on which the national stage commenced under 35 U.S.C. 371(b) or (f) or sixteen months from the filing date of the prior application. See 37 CFR 1.78(a)(2)(ii) and (a)(5)(ii). This time period is not extendable and a failure to submit the reference required by 35 U.S.C. 119(e) and/or 120, where applicable, within this time period is considered a waiver of any benefit of such prior application(s) under 35 U.S.C. 119(e), 120, 121 and 365(c). A

benefit claim filed after the required time period may be accepted if it is accompanied by a grantable petition to accept an unintentionally delayed benefit claim under 35 U.S.C. 119(e), 120, 121 and 365(c). The petition must be accompanied by (1) the reference required by 35 U.S.C. 120 or 119(e) and 37 CFR 1.78(a)(2) or (a)(5) to the prior application (unless previously submitted), (2) a surcharge under 37 CFR 1.17(t), and (3) a statement that the entire delay between the date the claim was due under 37 CFR 1.78(a)(2) or (a)(5) and the date the claim was filed was unintentional. The Director may require additional information where there is a question whether the delay was unintentional. The petition should be addressed to: Mail Stop Petition, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

If the reference to the prior application was previously submitted within the time period set forth in 37 CFR 1.78(a), but not in the first sentence(s) of the specification or an application data sheet (ADS) as required by 37 CFR 1.78(a) (e.g., if the reference was submitted in an oath or declaration or the application transmittal letter), and the information concerning the benefit claim was recognized by the Office as shown by its inclusion on the first filing receipt, the petition under 37 CFR 1.78(a) and the surcharge under 37 CFR 1.17(t) are not required. Applicant is still required to submit the reference in compliance with 37 CFR 1.78(a) by filing an amendment to the first sentence(s) of the specification or an ADS. See MPEP § 201.11.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-26 and 30-31 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

In regards to claims 1-26 and 30-31, the instant claims are drawn to a mathematical algorithm. A mathematical algorithm is non-statutory unless the claims include a step of physical transformation, or if the claims include a useful, tangible and concrete result. It is important to note, that the claims themselves must include a physical transformation step or an useful, tangible and concrete result in order for the claimed invention to be statutory. It is not sufficient that a physical transformation step or a useful, tangible, and concrete result be asserted in the specification for the claims to be statutory. In the instant claims, there is no step of physical transformation, thus the Examiner must determine if the instant claims include a useful, tangible, and concrete result.

In determining if the instant claims are useful, tangible, and concrete, the Examiner must determine each standard individually. For a claim to be "useful," the claim must produce a result that is specific, substantial, and credible. For a claim to be "tangible," the claim must set forth a practical application of the invention that produces a real-world result. For a claim to be "concrete," the process must have a result that can be substantially repeatable or the process must substantially produce the same result again. Furthermore, the claim must recite a useful, tangible, and concrete result in the claim itself, and the claim must be limited only to statutory embodiments. Thus, if

the claim is broader than the statutory embodiments of the claim, the Examiner must reject the claim as non-statutory.

The instant claims do not include any tangible result. A tangible requirement requires that the claim must set forth a practical application of the mathematical algorithm to produce a real-world result. The claims suggest an advanced comparison of two different models to produce a goodness of fit. This goodness of fit is a number and not a tangible or real-world result. Thus the claims 1-26 and 30-31 do not include any tangible result.

Claims 1-26 and 30-31 are drawn to a process. A statutory process must include a step of a physical transformation, or produce a useful, concrete, and tangible result (State Street Bank & Trust Co. v. Signature Financial Group Inc. CAFC 47 USPQ2d 1596 (1998), AT&T Corp. v. Excel Communications Inc. (CAFC 50 USPQ2d 1447 (1999)). In the instant claims, there is no step of physical transformation, thus the Examiner must determine if the instant claims include a useful, concrete, and tangible result.

In determining if the claimed subject matter produces a useful, concrete, and tangible result, the Examiner must determine each standard individually. For a claim to be "useful," the claim must produce a result that is specific and substantial. For a claim to be "concrete," the process must have a result that is reproducible. For a claim to be "tangible," the process must produce a real world result. Furthermore, the claim must be limited only to statutory embodiments.

Claims 1-26 and 30-31 do not produce a tangible result. A tangible result requires that the claim must set forth a practical application to produce a real-world result. This rejection could be overcome by amendment of the claims to recite that a result of the method is outputted to a display or a memory or another computer on a network, or by including a physical transformation.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4 and 6-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Blas et al [Industrial & Engineering Chemistry Research, 1998, volume 37, pages 660-674].

Claims 1-4 and 6-13 state:

1. A method of detecting an interaction among agents in a group using a fixed-ratio ray design and determining whether subsets of said agents also interact, comprising the steps of a. determining an additivity model from single chemical data; b. fitting a mixture model in terms of total dose to mixture data from fixed-ratio rays; c. statistically comparing said additivity model to said mixture model, wherein a difference between said additivity model and said mixture model indicates an interaction among said agents in said group; d. removing at least one subset of agents from said group, wherein relative ratios of remaining agents stay the same as in said fixed-ratio ray design; e. repeating steps b and c for agents remaining in said group after removal of said subset; and f. determining whether or not said remaining agents interact with said subset of agents by utilizing statistical methods based on algebraic manipulations relating full and reduced ray mixture models.

2. The method of claim 1 wherein said method is applied to a plurality of full-ray groups.

3. The method of claim 1 further comprising the step of carrying out steps b.and c for said subset of agents.

4. The method of claim 1, wherein said additivity model is graphically represented as an additivity curve and said mixture model is graphically represented as a mixture curve in terms of total dose.

6. A method of detecting, in a group of agents, using a fixed-ratio ray design, the number of agents that interact, and determining whether subsets of said agents also interact, comprising the steps of a. fitting a suitable polynomial in total dose to experimental data obtained with a combination of said agents; b. statistically identifying higher order terms of said polynomial that are not equal to zero, wherein the number of agents that interact in said group of agents is equal to the degree of said higher order terms that are not equal to zero; c. removing at least one subset of agents from said group, wherein relative ratios of remaining agents stay the same as in said fixed-ratio ray design; d. repeating steps a and b for agents remaining in said group after removal of said subset; e. determining whether or not said remaining agents interact with said subset of agents by utilizing statistical methods based on algebraic manipulations relating full and reduced ray mixture models.

7. The method of claim 6 wherein said method is applied to a plurality of full-ray groups.

8. The method of claim 6 further comprising the step of carrying out steps a and b for said subset of agents.

9. The method of claim 6, wherein single chemical data are used to estimate an additivity model which is linked to a linear term in said polynomial model.

10. The method of claim 9, wherein an additivity model is graphically represented as an additivity curve and said polynomial model is graphically represented as a mixture curve in terms of total dose.

11. The method of claim 6, wherein said polynomial is embedded in a generalized linear model.

12. The method of claim 6, wherein said polynomial is embedded in a general non-linear model.

13. The method of claim 6, further comprising the step of generating a graphical representation of said polynomial in total dose.

The article of Blas et al., entitled, "Prediction of binary and ternary diagrams using the statistical associating fluid theory (SAFT) equation of state," examines ternary mixtures of heptane, ethane and butane and each of the three binary mixtures associated with these three compounds.

Ternary phase diagrams (i.e. Figures 19-27 on pages 670-671 of Blas et al.) are graphical representations used as a means of quantifying interactions among agents (i.e. methane-propane-butane) and is capable of being used for fixed ratio-ray design in that for a specifically dictated composition, phase equilibria and interactions between the chemicals are determined. Equations 3 through 20 in Blas et al. (pages 662-664) describe an additivity model for calculation of the residual Helmholtz free energy of a mixture with linear and non-linear expressions (i.e. equation 3 is linear, equations 6 and 8 are nonlinear). Equations 11-13 describe a set of polynomials. In Figure 19 on page 670, the marks on the ternary phase diagram represent the observed, empirical model (i.e. the mixture model) while the lines represent the theoretical model (additivity model). The data is comprised of multiple composition ratios (rays). The analysis of fits of the lines to the marks represents a statistical comparison of two models.

When one of the agents is removed from the group, one of three binary mixtures results. Figure 17 of Blas et al. is an example of such analysis with a butane-heptane binary mixture. The marks on the plots represent the mixture model while the curved represent the additivity model. By comparing the ratios of components in the binary mixtures with that of the ternary mixtures, differences between the reduced (binary) and

full (ternary) ratios derived from the Figures of Blas et al. represent the statistical effects of the third component on the mixture.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 30-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blas et al [Industrial & Engineering Chemistry Research, 1998, volume 37, pages 660-674] in view of Combs et al. [Journal of Chemical Education, 1995, volume 72, pages 608-609].

Claims 30-31 state:

30. Software for causing a computer to carry out a method of detecting an interaction among agents in a group using a fixed-ratio ray design and determining whether subsets of said agents also interact, wherein said method comprises the steps of a. determining an additivity model from single chemical data; b. fitting a mixture model in terms of total dose to mixture data from fixed-ratio rays; c. statistically comparing said additivity model to said mixture model, wherein a difference between said additivity model and said mixture model indicates an interaction among said agents in said group; d. removing at least one subset of agents from said group, wherein relative ratios of remaining agents stay the same as in said fixed-ratio ray design; e. repeating steps b and c for agents remaining in said group after removal of said subset; and f. determining whether or not said remaining agents interact with said subset of agents by utilizing statistical methods based on algebraic manipulations relating full and reduced ray mixture models.

31. Software for causing a computer to carry out a method of detecting, in a group of agents, using a fixed-ratio ray design, the number of agents that interact, and determining whether subsets of said agents also interact, wherein said method comprises the steps of a. fitting a suitable polynomial in total dose to experimental data obtained with a combination of said agents; b. statistically identifying higher order terms of said polynomial that are not equal to zero, wherein the number of agents that interact in said group of agents is equal to the degree of said higher order terms that are not equal to zero; c. removing at least one subset of agents from said group, wherein relative ratios of remaining agents stay the same as in said fixed-ratio ray design; d. repeating steps a and b for agents remaining in said group after removal of said subset; e. determining whether or not said remaining agents interact with said subset of agents by utilizing statistical methods based on algebraic manipulations relating full and reduced ray mixture models.

The article of Blas et al., entitled, “Prediction of binary and ternary diagrams using the statistical associating fluid theory (SAFT) equation of state,” examines ternary mixtures of heptane, ethane and butane and each of the three binary mixtures associated with these three compounds.

Ternary phase diagrams (i.e. Figures 19-27 on pages 670-671 of Blas et al.) are graphical representations used as a means of quantifying interactions among agents (i.e. methane-propane-butane) and is capable of being used for fixed ratio-ray design in that for a specifically dictated composition, phase equilibria and interactions between

the chemicals are determined. Equations 3 through 20 in Blas et al. (pages 662-664) describe an additivity model for calculation of the residual Helmholtz free energy of a mixture with linear and non-linear expressions (i.e. equation 3 is linear, equations 6 and 8 are nonlinear). Equations 11-13 describe a set of polynomials. In Figure 19 on page 670, the marks on the ternary phase diagram represent the observed, empirical model (i.e. the mixture model) while the lines represent the theoretical model (additivity model). The data is comprised of multiple composition ratios (rays). The analysis of fits of the lines to the marks represents a statistical comparison of two models.

When one of the agents is removed from the group, one of three binary mixtures results. Figure 17 of Blas et al. is an example of such analysis with a butane-heptane binary mixture. The marks on the plots represent the mixture model while the curved represent the additivity model. By comparing the ratios of components in the binary mixtures with that of the ternary mixtures, differences between the reduced (binary) and full (ternary) ratios derived from the Figures of Blas et al. represent the statistical effects of the third component on the mixture.

However, Blas et al. does not teach use of computer software to automate the processes.

The article of Combs et al., entitled "Computer-generated ternary phase diagrams," teaches automation in the process of displaying and generating ternary phase diagrams as shown in Figures 2 and 3 on page 608.

Claims 14-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blas et al [Industrial & Engineering Chemistry Research, 1998, volume 37, pages 660-

674] in view of Gennings et al. [Journal of Agricultural, Biological, and Environmental Statistics, volume 2, 1997, pages 198-211].

Claims 14-26 state:

14. A method of determining an interaction threshold for agents in a group, comprising the step of generating a generalized linear model or general nonlinear model that permits estimation of the boundaries between a region of additivity of said agents and a region of interaction of said agents, wherein said boundaries define said interaction threshold.

15. The method of claim 14, wherein said region of additivity of said agents and said region of interaction of said agents is determined by the steps of a. determining an additivity model from single chemical data; b. fitting an interaction threshold mixture model that incorporates an interaction threshold parameter in terms of total dose to mixture data from fixed-ratio rays; and c. statistically comparing said additivity model to said interaction threshold mixture model, wherein a region of difference between said additivity model and said interaction threshold mixture model indicates a region of interaction among said agents in said group, and a region of coincidence between said additivity model and said interaction threshold mixture model indicates a region of additivity among said agents in said group.

16. The method of claim 15 wherein said method is applied to a plurality of full-ray groups.

17. The method of claim 15 further comprising the steps of d. removing at least one subset of agents from said group wherein relative ratios of remaining agents stay the same as in said fixed-ratio ray design; e. repeating steps b and c for agents remaining in said group after removal of said subset; and f. determining whether or not said remaining agents interact with said subset of agents by utilizing statistical methods based on algebraic manipulations relating full and reduced ray interaction threshold mixture models.

18. The method of claim 15 further comprising the step of carrying out steps b and c for said subset of agents.

19. The method of claim 14, wherein said region of additivity of said agents and said region of interaction of said agents is determined by the steps of a. determining an additivity model from single chemical data; b. fitting an interaction threshold mixture model that incorporates an interaction threshold parameter in terms of total dose to mixture data from fixed-ratio rays, wherein said region of additivity is conditioned on results obtained in step a; and c. statistically comparing said additivity model to said interaction threshold mixture model, wherein a region of difference between said

additivity model and said interaction threshold mixture model indicates a region of interaction among said agents in said group, and a region of coincidence between said additivity model and said interaction threshold mixture model indicates a region of additivity among said agents in said group.

20. The method of claim 19 wherein said method is applied to a plurality of full-ray groups.

21. The method of claim 19 further comprising the steps of d. removing at least one subset of agents from said group, wherein relative ratios of remaining agents stay the same as in said fixed-ratio ray design; e. repeating steps b and c for agents remaining in said group after removal of said subset; and f. determining whether or not said remaining agents interact with said subset of agents by utilizing statistical methods based on algebraic manipulations relating full and reduced ray interaction threshold mixture models.

22. The method of claim 19 further comprising the step of carrying out steps b and c for said subset of agents.

23. The method of claim 14, wherein said region of additivity of said agents and said region of interaction of said agents is determined by the steps of a. fitting an interaction threshold mixture model parameterized with a polynomial function for regions of interaction to experimental data obtained with a combination of said agents, and b. statistically testing whether the interaction threshold parameter is different from zero and identifying higher order terms of said polynomial that are not equal to zero.

24. The method of claim 23 wherein said method is applied to a plurality of full-ray groups.

25. The method of claim 23, further comprising the steps of c. removing at least one subset of agents from said group wherein relative ratios of remaining agents stay the same as in said fixed-ratio ray design; d. repeating steps a and b for agents remaining in said group after removal of said subset; and e. determining whether or not said remaining agents interact with said subset of agents by utilizing statistical methods based on algebraic manipulations relating full and reduced ray mixture models.

26. The method of claim 23, wherein single chemical data are also utilized.

The article of Blas et al., entitled, “Prediction of binary and ternary diagrams using the statistical associating fluid theory (SAFT) equation of state,” examines ternary

mixtures of heptane, ethane and butane and each of the three binary mixtures associated with these three compounds.

Ternary phase diagrams (i.e. Figures 19-27 on pages 670-671 of Blas et al.) are graphical representations used as a means of quantifying interactions among agents (i.e. methane-propane-butane) and is capable of being used for fixed ratio-ray design in that for a specifically dictated composition, phase equilibria and interactions between the chemicals are determined. Equations 3 through 20 in Blas et al. (pages 662-664) describe an additivity model for calculation of the residual Helmholtz free energy of a mixture with linear and non-linear expressions (i.e. equation 3 is linear, equations 6 and 8 are nonlinear). Equations 11-13 describe a set of polynomials. In Figure 19 on page 670, the marks on the ternary phase diagram represent the observed, empirical model (i.e. the mixture model) while the lines represent the theoretical model (additivity model). The data is comprised of multiple composition ratios (rays). The analysis of fits of the lines to the marks represents a statistical comparison of two models.

When one of the agents is removed from the group, one of three binary mixtures results. Figure 17 of Blas et al. is an example of such analysis with a butane-heptane binary mixture. The marks on the plots represent the mixture model while the curved represent the additivity model. By comparing the ratios of components in the binary mixtures with that of the ternary mixtures, differences between the reduced (binary) and full (ternary) ratios derived from the Figures of Blas et al. represent the statistical effects of the third component on the mixture. Single chemical data are also analyzed in Blas et al. (Figures 2-5).

However, Blas et al. do not show thresholds and their usage to determine boundaries between regions of additivity and non-additivity.

The article of Gennings, entitled, “Detection of departures from additivity in mixtures of many chemicals with a threshold model,” Gennings et al. show three-axis plots of the interactions between two chemicals and the threshold additivity surface. The theoretical parameters for determining thresholds are shown in equation 1.1. Another three dimensional threshold surface is shown in Figure 2 for three chemicals physically interacting.

It would have been obvious at the time of the instant invention for someone of ordinary skill in the art to practice Blas et al. in view of Gennings et al. to result in the instantly claimed invention because while both sources compares three fluids in phase diagrams investigating interactions and additivity models, Gennings has the advantage of applying a threshold to the additivity model.

Claims 1 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blas et al [Industrial & Engineering Chemistry Research, 1998, volume 37, pages 660-674] in view of Gennings et al. [Journal of Agricultural, Biological, and Environmental Statistics, volume 2, 1997, pages 198-211].

1. A method of detecting an interaction among agents in a group using a fixed-ratio ray design and determining whether subsets of said agents also interact, comprising the steps of a. determining an additivity model from single chemical data; b. fitting a mixture model in terms of total dose to mixture data from fixed-ratio rays; c. statistically comparing said additivity model to said mixture model, wherein a difference between said additivity model and said mixture model indicates an interaction among said agents in said group; d. removing at least one subset of agents from said group, wherein relative ratios of remaining agents stay the same as in said fixed-ratio ray design; e. repeating steps b and c for agents remaining in said group after removal of said subset; and f. determining whether or not said remaining agents interact with said subset of

agents by utilizing statistical methods based on algebraic manipulations relating full and reduced ray mixture models.

5. The method of claim 1, further comprising the step of determining simultaneous confidence bands on the difference between said additivity curve and said mixture curve or between mixture curves on full and reduced rays.

The article of Blas et al., entitled, "Prediction of binary and ternary diagrams using the statistical associating fluid theory (SAFT) equation of state," examines ternary mixtures of heptane, ethane and butane and each of the three binary mixtures associated with these three compounds.

Ternary phase diagrams (i.e. Figures 19-27 on pages 670-671 of Blas et al.) are graphical representations used as a means of quantifying interactions among agents (i.e. methane-propane-butane) and is capable of being used for fixed ratio-ray design in that for a specifically dictated composition, phase equilibria and interactions between the chemicals are determined. Equations 3 through 20 in Blas et al. (pages 662-664) describe an additivity model for calculation of the residual Helmholtz free energy of a mixture with linear and non-linear expressions (i.e. equation 3 is linear, equations 6 and 8 are nonlinear). Equations 11-13 describe a set of polynomials. In Figure 19 on page 670, the marks on the ternary phase diagram represent the observed, empirical model (i.e. the mixture model) while the lines represent the theoretical model (additivity model). The data is comprised of multiple composition ratios (rays). The analysis of fits of the lines to the marks represents a statistical comparison of two models.

When one of the agents is removed from the group, one of three binary mixtures results. Figure 17 of Blas et al. is an example of such analysis with a butane-heptane

binary mixture. The marks on the plots represent the mixture model while the curved represent the additivity model. By comparing the ratios of components in the binary mixtures with that of the ternary mixtures, differences between the reduced (binary) and full (ternary) ratios derived from the Figures of Blas et al. represent the statistical effects of the third component on the mixture. Single chemical data are also analyzed in Blas et al. (Figures 2-5).

However, Blas et al. does not show confidence bands on their additivity models.

The article of Huang et al, entitled, "Partial pressures and thermodynamic properties of PbTe-SnTe solid and liquid solutions with 13, 20, and 100 mole percent SnTe," illustrates such confidence bands in Figure 12 on page 1557 with a caption stating, "Partial pressure of SnTe(g) for 13, 20, and 100 m/o SnTe solid solutions and, for 20 and 100% their melts vs. reciprocal solid solution or melt temperature. Curves above and below the solid straight lines indicate the 95% confidence level of uncertainty. Dashed lines are calculated for an ideal solution of PbTe and SnTe."

It would have been obvious to someone of ordinary skill in the art at the time of the instant invention to practice Blas et al. in view of Huang et al. resulting in the instantly claimed invention because while both studies are commonly used to analyze phase diagrams of mixtures, Huang et al. has the advantage of being applicable to certain level of confidence statistical analyses.

Conclusion

No claim is allowed.

Papers related to this application may be submitted to Technical Center 1600 by facsimile transmission. Papers should be faxed to Technical Center 1600 via the central PTO Fax Center. The faxing of such pages must conform with the notices published in the Official Gazette, 1096 OG 30 (November 15, 1988), 1156 OG 61 (November 16, 1993), and 1157 OG 94 (December 28, 1993)(See 37 CFR § 1.6(d)). The Central PTO Fax Center Number is (571) 273-8300.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Russell Negin, Ph.D., whose telephone number is (571) 272-1083. The examiner can normally be reached on Monday-Friday from 7am to 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's Supervisor, Andrew Wang, Supervisory Patent Examiner, can be reached at (571) 272-0811.

Any inquiry of a general nature or relating to the status of this application should be directed to Legal Instrument Examiner, Tina Plunkett, whose telephone number is (571) 272-0549.

Information regarding the status of the application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information on the PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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10 June 2006

11 June 2006
JOHN S. BRUSCA, PH.D
PRIMARY EXAMINER